



Proceedings from the International Forum on

Science Funding System Oriented to the 21st Century

Beijing, P.R.China
August 1-3, 2001

Chief Editor: CHEN Jia'er



HIGHER EDUCATION PRESS

Proceedings from the International Forum on

Science Funding System Oriented to the 21st Century

Beijing, P. R. China

August 1-3, 2001

Chief Editor: CHEN Jia'er



HIGHER EDUCATION PRESS

图书在版编目(CIP)数据

面向 21 世纪科学基金制度国际战略研讨会文集/国家自然科学基金委员会编. —北京: 高等教育出版社; 2002
ISBN 7-04-010484-9

I. 面… II. 国… III. 科学研究—基金—制度—
国际学术会议—文集 IV. G311-53

中国版本图书馆 CIP 数据核字(2001)第 088946 号

责任编辑 安 琪
封面设计 王凌波
版式设计 李 杰
责任校对 刘作仪
责任印制 陈伟光

出版发行 高等教育出版社
社 址 北京市东城区沙滩后街 55 号
邮政编码 100009
传 真 010-64014048

购书热线 010-64054588
免费咨询 800-810-0598
网 址 <http://www.hep.edu.cn>
<http://www.hep.com.cn>

经 销 新华书店北京发行所
印 刷 北京民族印刷厂

开 本 850×1168 1/16
印 张 14.25
字 数 450 000
定 价 45.00 元

版 次 2002 年 6 月第 1 版
印 次 2002 年 6 月第 1 次印刷
彩 插 1

© Higher Education Press Beijing 2002

版权所有 侵权必究

Congratulation Letter

Vice-Premier LI Lanqing
P. R. China

Ladies and Gentlemen:

It is my pleasure, on behalf of the Chinese government, to extend my sincere welcome to the leaders from 24 national and regional science funding organizations and research institutions at the "International Forum on Science Funding System Oriented to the 21st Century" held in Beijing.

Peace and development are the two themes of today's world. Along with the surging trend of globalization of economy, science and technology, the knowledge-based economy will take the lead in the economic development of the new century, and will exert immeasurable influence on the progress of the society. Under such a condition, countries in the world are taking every effort to seize the opportunity in formulating and readjusting their strategies to promote science and technology, duly increase their investments, and push forward the construction of the national innovation system to accelerate socioeconomic development, and to make active contributions to the advancement of civilization for the mankind.

Chinese government has been highly emphasizing science and technology. We have implemented the strategy of "revitalizing China through science and education", and have taken the progress of science and technology as the motive force to realize the strategic goal of constructing socialist modernization. For that end, we will continue to increase the investment to the national science fund.

The development of science and technology requires strong financial support, but it also depends on the constant innovation of the science and technology management system, so that it may guarantee every researcher adequate opportunities to bring into full play his or her scientific talents, create a favorable environment conducive to the development of researchers' sensitivity and creativity, foster a pool of outstanding talented people, and build a contingent of qualified researchers. The science funding system has made outstanding contributions to these aspects, and it will continue to improve itself in the future development and constantly push forward the innovation of science and technology.

It is my sincere wish that the Forum provide a good opportunity to exchange views and hold discussions on the development and improvement of the national science funding system, and achieve positive outcome.

China's science funding management staff are expected to share the experience with their foreign counterparts, earnestly learn from their foreign colleagues, draw the advantages from all sides and formulate their own characteristics.

Opening Remarks

Prof. ZHOU Bingkun
Vice-President, NSFC
Member of CAS

Good morning
Distinguished representatives,
Ladies and Gentlemen:

It is my special pleasure and honor to announce the opening of the International Forum on Science Funding System Oriented to the 21st Century.

Half a month ago, people in Beijing celebrated the successful bidding of the 2008 Olympic Game. Today, we gather here to celebrate the 15th anniversary of the founding of the National Natural Science Foundation of China in the form of International Forum on Science Funding System oriented to the 21st Century. Please allow me, on behalf of all the staff of NSFC, to express our warm welcome and heartfelt thanks to all of you here, especially our friends from foreign science foundations and research institutions. Despite your heavy duty and responsibility and the hot summer weather, you come a long way to Beijing to share with us the joyful moment and to exchange experience and views concerning the development of the science funding system.

Fifteen years ago, NSFC was founded as a result of the open-door policy and the reform of Chinese science and technology structures. In the past 15 years, under the strong support of the Central government and the whole scientific community in China, NSFC has made continuous and painstaking efforts in creating a favorable environment for Chinese scientists to carry out innovative research, in pushing forward the development of frontier scientific disciplines, in cultivating and fostering a large number of scientific trail-blazers and young researchers of high caliber, thus making due contributions to the upgrading of the overall quality of basic research in China.

NSFC always attaches great importance to international cooperation and exchange since we believe that through substantial collaboration, we can select mutually interested projects of high quality, jointly make physical and human resources, conduct joint research and share the achievements. By now, a multilevel, multichannel and comprehensive cooperative pattern has been basically formed. We have signed 55 agreements with our counterparts in 39 countries and regions. The funds used for international cooperation and exchange reaches nearly 15% of our total budget. The place where we are now having our forum, the Sino-German Center for Research Promotion, is one of the excellent examples resulted from our fruitful cooperation.

As we are now entering the new century and as science and technology in the world is progressing in an unprecedented speed, the science funding systems in various countries are facing extreme challenges and major opportunities. To accommodate to the requirement of science and technology under the new circumstances, we need to draw the useful experience from our colleagues, to learn from each other, and to explore new ways and adopt new policies. This is the focal point and exactly where the importance of the Forum lies. I strongly believe that this forum will exert great impetus not only to the development of science funding system and basic research in China, but also to that in the world.

May I wish a complete success of this forum and the very best of all of you present here today.

Organizing Committee

Chairman: Prof. CHEN Jia'er, President

National Natural Science Foundation of China (NSFC)

Co-Chair: Dr. Rita Colwell, Director

National Science Foundation (NSF)

Prof. Vicki Sara, Chief Executive Officer

Australian Research Council (ARC)

Dr. Ernst-Ludwig Winnacker, President

Deutsche Forschungsgemeinschaft (DFG)

Editorial Committee

Director: CHEN Jia'er

Member: ZHOU Bingkun, ZHU Zuoyan, WANG Jie, HAN Jianguo

ZHAO Xuewen, WANG Wenxuan, BAI Ge

Editor: HAN Yu, LIU Zuoyi, ZHANG Lin

CONTENTS

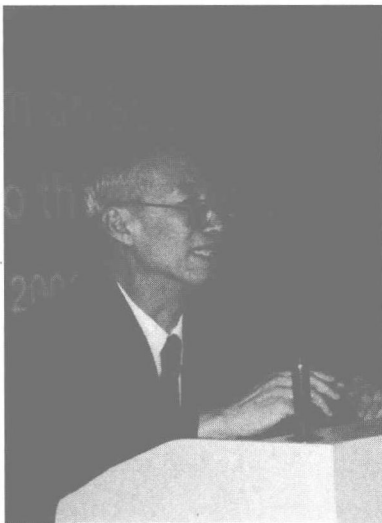
	Congratulation Letter.....	I
	Vice-Premier LI Lanqing, P. R. China	
	Opening Remarks.....	II
	Prof. ZHOU Bingkun, Vice-President, NSFC, Member of CAS	
I.	Formulating NSFC's Development Strategies for the New Century	1
	Prof. CHEN Jia'er, President, NSFC	
II.	A Funding Agency's Contribution to Innovation	14
	Dr. Ernst-Ludwig Winnacker, President, DFG	
III.	Speech at the International Forum on Science Funding System	
	Oriented to 21 st Century	22
	Prof. CHENG Jinpei, Vice-Minister, Ministry of Science and Technology (MOST)	
IV.	Science and Technology in A Global Society:	
	Crossing Boundaries to New Frontiers	26
	Dr. Rita R. Colwell, Director, the NSF	
V.	Some Consideration about the Development of Basic Research in China	38
	Prof. BAI Chunli, Vice-President, Chinese Academy of Sciences (CAS)	
VI.	Recent Changes in Research Support in Canada	42
	Dr. William M. Coderre, Director of Cooperate Development, Natural Sciences and Engineering Research Council of Canada (NSERC)	
VII.	Prospective in Japan for the Research and Development Investment	50
	Teiichi Sato, Director-General, Japan Society for the Promotion of Science (JSPS)	
VIII.	21 st Century Science Funding in Australia	58
	Prof. Vicki Sara, Chief Executive Officer, ARC	

IX.	Science in the Czech Republic: Funding and Administration, Grant Agency of the Czech Republic	83
	Dr. Pavel Chráska, Vice-President, Grant Agency of the Czech Republic	
X.	Science in the Czech Republic: Funding and Administration, Academy of Sciences of the Czech Republic	94
	Dr. Jiří Rákosník, CSc., Member of the Academy Council, Academy of Sciences of the Czech Republic (ASCR)	
XI.	Balancing Private and Public Funding and Benefits within Public Research Institutions	102
	Dr. Michel A. Bureau, President and Chief Executive Officer, Fonds de la Recherche en Santé du Québec (FRSQ)	
XII.	Science Funding for the Twenty-First Century: View from a Small System	107
	Dr. Kenneth Young, Chairman, Research Grants Council (RGC)	
XIII.	Opportunities in Biotechnology and the Biosciences in the 21 st Century	115
	Prof. Raymond Baker, Chief Executive, Biotechnology and Biological Sciences Research Council (BBSRC)	
XIV.	The CNRS: Past, Present and Future	126
	Dr. Geneviève Berger, Director-General, Centre National de la Recherche Scientifique (CNRS)	
XV.	Mission Impossible? Finland Facing the Changing Future	137
	Prof. Reijo Vihko, President, the Academy of Finland (AF)	
XVI.	Orientation Document for INRA, 2001-2004	143
	Dr. Bertrand Hervieu, President, Institut National de la Recherche Agronomique (INRA) Dr. Marion Guillou, Chief Executive Officer	
XVII.	50 Years of Evaluation at CERN: Preparing the Way for Collaboration at the LHC and in the 21 st Century	151
	Prof. Roger J. Cashmore, Director of Research, European Organization for Nuclear Research (CERN)	

XVIII.	Knowledge and Innovation in the 21 st Century: Prospectives on Creating Value through Basic Research	160
	Dr. Chung-Duk Kim, Chairman, Korea Science and Engineering Foundation (KOSEF)	
XIX.	Research Management into the 21 st Century: the Case for Ocean Sciences.....	170
	Dr. Jean-François Minster, President and Director-General, L'Institut National de la Recherche pour l'Exploitation de la Mer (IFREMER)	
XX.	Organization and Support of Scientific Research in the Republic of Belarus	176
	Prof. Anatoly I. Lesnikovich, Chairman, State Committee on Science and Technology of Belarus Prof. Alexander S. Rubanov, Chairman, the Belarusian Republican Fund for Basic Research Republic of Belarus	
XXI.	Promotion of Young Scientists in Switzerland	185
	Prof. Heidi Diggelmann, President, Swiss National Science Foundation (SNSF)	
XXII.	The Toyota Foundation's Role in Japan and Asia.....	190
	Mr. Chimaki Kurokawa, Director, the Toyota Foundation	
XXIII.	A Private Agenda for A Public Cause	195
	Dr. Anthony Tsui, Director, the Croucher Foundation (CF)	
XXIV.	Science and Technology Funding System in Pakistan	199
	Dr. Shahzad A. Mufti, Chairman, Pakistan Science Foundation	
XXV.	Summary Remarks.....	206
	Dr. Ernst-Ludwig Winnacker, President, DFG	
XXVI.	Conclusion Remarks.....	213
	Prof. CHEN Jia'er, President, NSFC	

Formulating NSFC's Development Strategies for the New Century

Prof. CHEN Jia'er
Member of CAS
President, National Natural Science Foundation of China (NSFC)



Respected Chairman,
Distinguished Guests,
Ladies and Gentlemen:

Good morning!

In the very first year of the new century, it is a great delight for the National Natural Science Foundation of China (NSFC) to celebrate its 15th birthday. For this happy event, we are honored to have here in Beijing distinguished representatives from 24 science funding organizations and research institutions of 15 countries and regions, to exchange views about the development strategies of the science funding system in the 21st century. "What a pleasure it is to see friends come from afar" — with this old Chinese saying, I would like to extend our warm welcome to all the distinguished participants at the Forum.

Now, I would like to briefly review the performance of the NSFC in the past 15 years and introduce our plans for the future.

(I)

Suggested by Mr. Deng Xiaoping and sanctioned by the State Council, NSFC was founded in February 1986, as an organization directly under the jurisdiction of the State Council to administrate the national natural science fund. Its main mission is to support basic research and some of applied research, identify and foster talented researchers in the realm of science and technology, accelerate the progress of science and technology, and promote the socioeconomic development in China by appropriate management of the national natural science fund from the central government.

The establishment of NSFC embodied the Chinese government's practice of Mr. Deng Xiaoping's theory that science and technology constitute the prime force behind productivity. It was a strategic step to enhance basic research in China. It marked China's bid to further deepen the reform of science and technology management, and to transform science funding from a central planning system to a competitive system compliant with the socialist market economy. It shows the respect and encouragement to scientific innovation by the Chinese government, and has been successful in promoting the democratic management of science and technology in this country.

(II)

During the 15 years since its establishment, NSFC has been enjoying special concern from the Chinese government and the valuable support from scientists nation-wide. We have been successful in accelerating the progress of basic research and facilitating the achievement of breakthroughs in key scientific projects, and have seen good results in upgrading the overall standard of basic research and identifying and fostering talent in science and technology. There can be seen as in the following:

I) Oriented to the support of basic research and strengthen the source role in scientific innovation.

NSFC, as one of the major sources of support for basic research provided by the Chinese government, is an important link in the chain of China's strategy to promote basic research. NSFC's budget, starting from 80 million RMB when it was first established in 1986, has been increasing at an annual rate of 26%, and has reached 1.6 billion RMB this year and will be 2 billion next year. During the past 15 years we have supported a total of 52,000 projects, thus playing a significant role in promoting the progress and enhancing the overall quality of basic research in China. We are one of the major forces to support scientific and technological innovation. (Slide 1)

Steadily supported by the national science fund, the overall quality in a number of disciplines and areas has been upgraded to a great extent in China. Research in frontier areas has been among the priorities funded by NSFC, and a number of highly recognized results with international recognition have been achieved. A great number of projects initially supported by NSFC have been included in the national major science and technology development programs, which have played a significant role in promoting research in newly emerged scientific areas. (Slide 2)

II) Continuously explore effective ways to foster and maintain the contingent of talented researchers.

Talented people are vital in the promotion of science. NSFC puts special emphasis on the support to talent. A human resource strategy has been implemented, under which a talent fostering and support system is taking form. (Slide 3)

On a competitive basis, NSFC has steadily supported approximately 60,000 researchers in basic science in China, including university teachers, professional researchers, post doctors and graduates associated with them, thus maintaining a reasonable breadth in the basic research manpower. In 1987, NSFC set up the Young

Scientists Fund which is oriented towards researchers under 35 years of age. Till now, about 7,400 researchers have been funded under this program. The National Science Fund for Distinguished Young Scholars, which is open to researchers under 45, has supported 710 outstanding young scientists during the 6 years since its establishment, with 80% grantees being returned scholars from abroad. The Joint Fund for Overseas, Hong Kong and Macao Young Scientists, which was commenced in 1998, has approved grants to 144 such researchers so far. NSFC started a pilot program to support innovative research groups last year, and is preparing to enlarge its scope gradually.

The implementation of a human resource strategy has reaped excellent results. Under our steady support and through a series of measures to foster and stabilize qualified researchers adopted by the country, China's basic research team is realizing a transfer from a simple "quantitative stability" to a "qualitative improvement" which is marked by innovation. A number of young and middle-aged researchers who are in their prime time to bring about innovative ideas have become the main force in carrying out national science fund projects. Among the principal investigators of NSFC's General Program projects, the ratio of researchers under 45 has increased from 12.2% in 1986 to about 66% in 2000, with a considerable number growing into leading scientists with high impact nationally and internationally. Most of the outstanding young researchers recently elected as Members of the Chinese Academy of Sciences and who are working as principal investigators of the National Key Basic Research Programs ("973" Program) have been continuously supported by us. (Slide 4)

III) Explore ways for the integration of knowledge innovation with technological and socioeconomic demands.

Basic research, applied research and experimental development for realistic applications form a networking and interrelated relationship in the process of cultural and socioeconomic development. It is evident that basic research plays an essential role as the source of technology innovation, while social and technological requirements drive basic research to a new horizon. Therefore, it is vital to strengthen the link between knowledge innovation with technological innovation and socioeconomic demands via encouraging cooperation among universities, research institutions, and industrial and governmental sectors so as to improve the innovation performance. Based on this analysis, NSFC is increasing its investment in joint funding with Chinese and foreign companies, local governments and State research institutions. As a matter of fact, with the emerging of the national innovation system, the socialization of basic research is becoming an irresistible trend. In many developed countries, the ratio of non-governmental investment is remarkable. (Slide 5)

To respond to and support the government's strategy to develop the west, NSFC has launched the "Major Research Program" on key scientific issues to restructure the development of these regions. Scientists from the east, central and west parts of the country are absorbed to devote joint efforts in the research. It is our hope that, through these approaches, NSFC will be able to guide our scientists' efforts towards innovative research in areas of major significance to the nation. We also aim at helping build a knowledge pool and human resources reservoir to resolve key scientific issues in the socioeconomic development and in the technology innovation of traditional industries, to initiate high-tech industries, and to realize technology transfer.

IV) Adhere to the principle of "equality and mutual benefit" and open up more channels for international cooperation.

Basic research is international by nature. This makes it necessary that basic research be carried on internationally in a cooperative and competitive manner. NSFC pays special attention to the promotion of international cooperation and exchange in basic research by increasing the annual budget, broadening channels and creating a favorable environment for the latter. So far we have established formal cooperative relationships with 55 science-funding agencies and research institutions in 39 countries and regions (Slide 6). A portfolio consisting of 5 categories of projects for international cooperation and exchange has been formed, and a total number of 16,317 projects have been granted to date. We have supported a number of major and substantial international joint research activities as well as the participation by Chinese researchers in major international research programs. The Sino-German Center for Research Promotion jointly established by NSFC and DFG has been put to use. High level bilateral symposiums with foreign countries are becoming more active. Many of the major international conferences or workshops supported by NSFC have produced wide-spread influence. We have also made active use of the Internet to help establish virtual joint research centers. Extensive international cooperation and exchange has facilitated the creation of a favorable international environment for the development of China's basic research.

V) Closely combine reform with development, and take reform as the impetus to development.

The science funding system in China is relatively new. On the basis of sharing experience with foreign countries, we are making every effort in the spirit of reform to adapt our own system to China's specific situation, and to look for solutions to new issues appearing in the process of its development. (Slide 7) We have completed a management system of our foundation in which the advisory, decision-making, implementation and supervision sectors are coordinated with each other. A review principle of "relying on experts and developing democracy to select best proposals for support in a fair and reasonable way", and an operating mechanism with "scientific democracy, fair competition and stimulating innovation" as its core, have been formulated. Moreover, a funding portfolio consisting of General Program, Key Program, Major Program, funds to support talented researchers and a series of special funds has been set up which is working harmoniously. (Slide 8)

The science funding system has not only realized its functional transformation from the unitary management of projects to a comprehensive administration, but also has played an exemplary leading role for the development of local and professional science funding organizations. It has helped the formation of the country's funding system, with NSFC as its leading factor, and local and professional science funding organizations as the two wings. So far, more than 50 science foundations at the provincial and ministerial levels have been established in Beijing, Shanghai and other provinces and cities.

From our experience in the past 15 years we have realized that the basic reason why our science funding system has achieved such good results in China is that it is a mechanism with tremendous vitality — a mechanism to encourage scientific democracy, fair competition and innovation. The mechanism of scientific

democracy means that we must rely on the systematic and extensive participation of scientists in the management of science funding, and make sure that our funding strategies are on a scientific and democratic basis. The mechanism of fair competition means that we should make the Guide to Program, eligibility of researchers and peer review results open to scientists all over the country, and create fair and equal opportunities for qualified scientists devoted to basic research. The mechanism to encourage innovation means that research with a strong innovative nature is among the priorities for funding based on the above mentioned two mechanisms, so that our limited resources could effectively promote such research.

Meanwhile, we admit that there is still a long way to go since China's science funding system is just in an early stage of development. We need to explore effective measures to resolve problems and meet the emerging needs in our work. For example, the average funding intensity and the success rate are relatively low, the funding environment is not favorable enough to promote primary innovation, especially original innovation, it needs substantial efforts and further development to improve; the evaluation of research results and its management system need to be duly improved; Internet and information technology should be more widely applied to the management of projects, etc. To meet these needs, we would like to hear your valuable comments and suggestion, and share with your experience.

(III)

The 21st Century is a new era with knowledge-based economy booming rapidly, and economic globalization is becoming an inevitable trend. It is a time that competition at the forefront of science and technology, embodying comprehensive national strength, is becoming fiercer and fiercer. It is also a key period for China to realize the third step in her development strategy and to push forward her all-round socialist modernization.

A famous official in the Tang Dynasty, Wei Zheng, had a saying like this: "For a tree to grow, it is necessary to strengthen its roots; for a river to flow, it is necessary to dredge its source". Likewise, to develop a knowledge-based economy — the result of the increase of knowledge changing from quantitative accumulation to qualitative improvement, we must emphasize the generation of new knowledge, for which basic research is one of the major sources. The ability to create knowledge and the ability to put knowledge to proper use will build the supporting platform for a nation's competitiveness. President Jiang Zemin of the People's Republic of China requests that we "encourage original innovation, and save no efforts in escalating to the top of world science", and "pay special attention to the source innovation of science and technology". China is a large developing country. Its natural science fund should be primarily focused on promoting the development of the country's science, culture and economy, and enhancing the country's comprehensive capacity. Meanwhile, it should also make due contributions to the advance of civilization of the whole mankind.

Under such circumstances, we have set the strategic goal for NSFC as being the fertile soil to breed source innovation, the cradle to foster creative talents, the link to combine knowledge innovation and technology innovation, the bridge to facilitate international cooperation and exchange, and the brain trust to provide consultation for the decision-making of the country's major scientific strategies. We should contribute to furthering the development and prosperity of China's basic research and applied basic research, and improving the capacity to achieve continuous science and technology innovation. (Slide 9)

To realize the above-mentioned goals, we are taking the following measures:

A. Create a favorable funding environment conducive to source innovation.

We will continue our efforts to strive for a greater budget from the central government, so that the total investment for the next 5 years can exceed 10 billion RMB. On the basis of increasing funding intensity, we shall enlarge the funding scope for General Program projects and raise the success rate. Bearing in mind the special features of basic research and applied basic research, we should emphasize the fostering and accumulation process and increase the ratio of continuously supported projects. We should properly manage the relation between specifics and the over-all picture, and revise the portfolio of programs for the better. It is planned that the fund to support General Program projects is fixed at above 60% of the total. The number of Key Program projects is to be increased, while that of Major Program projects is to be slightly reduced. (Slide 10)

We feel it necessary and rewarding to respect and protect the scientific individuality of researchers and encourage their spirit and courage to bring about innovation. Isaac Newton said: "no bold conjecture, no great discovery". Through the establishment of "key reviewer recommendation system", the initiation of "small fund for early exploration", and the improvement of the appeal system, we aim at creating a more flexible mechanism to protect and support non-consensus projects or even "crazy ideas", and "let a hundred flowers blossom and a hundred schools of thoughts contend". For this end, we must ceaselessly improve the review environment and mechanism and take it as one of our core tasks. We also advocate fair treatment to each project and tolerance of failures. In the process of exploring the unknown and discovering the laws of nature, it is required that we should provide necessary protection and support research which may obtain inspiration from repeated failures and find new solutions to make new discoveries.

It is also required that on the basis of comprehensive analysis of the research results, we should classify them into different categories according to their real merit and contributions, and establish an integrated encouragement and recommendation system with the help of the Internet. We should not only pay attention to the evaluation of specific achievement, but also strengthen the overall evaluation of the funding performance of each scientific discipline by means of holding workshops and so on, so that we may have a clear understanding of the whole situation. We are also considering inviting authoritative scientists from abroad to help make objective and fair evaluations of the overall development of scientific disciplines in China.

B. Strongly promote interdisciplinary research, and support newly emerging subjects and disciplines.

A great number of facts about the development of science demonstrate that major breakthroughs, new concepts, theories, methodologies and scientific issues are born from the crossing and interaction of different disciplines. As is known to all, the discovery of the double helix structure of DNA benefited from the integration of physics, chemistry and biology; and the rapid development of nano-technology is the result of the interaction of even more disciplines. Therefore, when we formulate science-funding policies, allocate resources and set evaluation systems, it is highly required that we must break the barriers between disciplines and disciplinary protectionism. (Slide 11) Targeted on major scientific issues, NSFC has initiated the Major Research Plan to effectively push forward interdisciplinary research, promote the exchange and interaction of ideas among researchers with different academic views and different scientific background, and enhance the integration and